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BY L. R. NASH

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# VALUATION OF PUBLIC SERVICE PROPERTIES

BY L. R. NASH

During the last few years increasing attention has been paid to the determination of the value of properties employed in public service. The purposes of such investigations and the methods of procedure have been varied. While an encouraging tendency toward standardization is apparent in some features of valuation work, there is still lack of agreement among engineers, commissions and other interested parties with reference to certain elements and methods which are of very great importance. The purpose of this paper is to briefly summarize opinions, decisions and methods bearing on the various important factors in the problem, and to outline some uses which are made of valuation figures. The facts and arguments to be presented are familiar to professional appraisers and engineers, but it is hoped that others who may occasionally have to consider questions of rates, increases in service, or extensions of lines, in which property values play an important part, may find some points of interest. For example, a manager of a street railway company may find that an inventory of the physical property of his company shows a value much less than the total of its capitalization, which he knows is consistent with the actual total costs, and he may be helped to clearly justify the difference, which unthinking critics may have exploited, as being a provision for the intangible elements which were necessary factors in the construction and development of the property.

Among the purposes for which appraisals are most commonly made are the following:

(1) Determination of rates or charges for service.
(2) Assessment of taxes.
(3) Limitation of security issues.
(4) Fixing prices for purchase or sale.

For the first two purposes appraisals usually originate in public service commissions or other public authorities; for the last two purposes they are most commonly made for bankers or investors. Opposing interests in the value of a particular property may sometimes present figures, both prepared by reputable engineers, which differ widely. Such differences are usually found to lie

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largely among the intangible elements, illustrating the inconsistencies which exist in their treatment.

It has been argued by some appraisers that the results of their work should be the same whatever the uses to which they are put. While great care should be taken that no valuations are biased by the purposes for which they are made, to the end that the physical elements may be consistent, it is more commonly held that the treatment of the intangible elements may properly depend upon the object of the appraisal.[1] A value for purposes of sale or rate making may be materially higher than for a bond issue or taxation, assuming that both the latter are concerned with physical property only. It is sometimes claimed that certain physical property, such as paving, should be excluded from valuations for taxation purposes because it is in itself a form of tax.

Appraisals may also be undertaken from two different points of view, to determine respectively the Actual Cost of the property or the Cost of Reproduction at the present time. Values determined by either of these methods may be reduced by a suitable amount to allow for depreciation, leaving the so called Present Value of the property. The original cost of the property, with its additions and extensions, is the thing needed in a large proportion of valuation cases. This is often difficult to determine, either because cost records are incomplete, or because they may contain abnormal amounts for contractors' profits, promotion, or other organization expenses, or charges which properly belong in operation, which cannot be segregated accurately from the legitimate construction charges. On the other hand certain elements of cost may be omitted or inadequately represented in the records. For such reasons it is more common for appraisers to determine the cost of reproduction, although this procedure is usually modified to some extent to allow for fluctuations in the costs of materials. The price of copper, for example, which enters largely into public service construction, varies through wide ranges, and it is the custom of appraisers to use the average price for a considerable number of years to avoid abnormally high or low values, which may obtain at the time of the appraisal.

A logical extension of this process would include the entire period of construction and development of the property in question in the determination of average prices, and also the use of a

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[1] N. Y. N. H. & H. R. R. Valuation Report (1911).

"weighted" average, that is, an average in which the price of each year or other period is weighted to the extent of the purchases made. A further and equally logical use of this process would apply it to the entire property, labor as well as material, with the result that the appraisal would be an estimate of the original cost of the property. The appraiser would exclude such items of property or other costs as in his judgment were outside the proper scope of his work, thus removing the principal objection to the direct use of actual cost records.

Having determined the cost of the existing physical property by one of the above methods, the question of its depreciation must be considered in determining Present Value. While some authorities believe that, for purposes of rate-making at least, there should be no reduction in value on account of depreciation so long as the property can be operated and its customers served at one hundred per cent. efficiency,[1] it is more commonly held that deductions should be made for visible deterioration. The leading case on this subject (Smyth vs. Ames)[2] cites Present (or depreciated) Value as only one of several factors to be considered in determining Fair Value, but more recent decisions have gradually read into this case an interpretation of Present Value as the dominant factor.[3] There has been some contention in favor of theoretical depreciation, that is, the scaling down of values each year by an amount determined by estimating the useful life of the various elements. This method has not been generally approved by the courts,[4] although it has found some favor with state commissions[5] and it is useful for other purposes to be considered later in this article.

The argument in favor of depreciated values may be summarized as follows: A property is supposed to earn a reasonable return upon its Fair Value in addition to its operating expenses, taxes, and a suitable allowance for depreciation. If the property depreciates, as is bound to happen to some extent under the best of management, its depreciated or present value together with the accumulated depreciation fund would equal the value when new. After replacements of worn out elements have been

[1] City of Racine (Wis.) vs. Racine Gas Company, 6 W. R. C. R. 228, 284.

[2] Smyth vs. Ames, 169 U. S. 466, 546 (1898).

[3] Cotting vs. Kansas City Stock Yards Co. 183 U. S. 79, 91.

[4] Willcox vs. Consolidated Gas Company, 212 U. S. 19.

[5] Metropolitan Street Railway Reorganization, 3 P. S. C. (1st D.) N.Y. 113, 153.

made from the depreciation fund, the increased present value, together with the balance of the depreciation fund, would still equal the value when new, this latter condition continuing indefinitely. If, with adequate earnings, no provision is made for depreciation, and all profit is distributed to the owners of the property in the form of dividends at unusually high rates, the excess in dividends should be considered as a portion of the investment returned in advance, leaving a balance reduced to the extent of the accumulated depreciation, which in turn is measured by the difference between present value and value new.

The argument above outlined appears logical for the conditions assumed, but fails to provide for one contingency, which unfortunately is not rare in public service operation; that is where gross earnings at prevailing rates are insufficient to provide for depreciation as well as operating expenses, taxes, and a fair return on the value of the property. The courts have held under such circumstances that, after expenses (including maintenance) and taxes have been paid, the investor has prior right over an accrual for depreciation. The Federal Courts have specifically decided[1] that properties which have been unable to write off the value of obsolete or worn out equipment out of their profits after paying proper dividends to their owners, may retain such equipment in their Fair Value until such time as earnings might be increased sufficiently to permit the writing off without curtailing returns to the owners. The Interstate Commerce Commission has followed the same practice in its rulings and accounting instructions. The State Commissions have not been uniform in their decisions, some using Cost of Reproduction, some Present Value, and others Present Value plus unearned depreciation. Decisions of the last named class have been supported by clearest arguments and are more consistent with court rulings. The Wisconsin Commission, whose comprehensive decisions are very frequently quoted, although not consistent in all its decisions on this point, has used in certain appraisals a depreciated value of physical property, but where necessary has added, in arriving at the Fair Value, such depreciation requirements as have not been earned together with other losses, within the limits of the Cost of Reproduction of the prop-

[1]Milwaukee El. Ry. & Lt. Co. vs. Milwaukee, 87 Fed. 577; Ames vs. Union Pacific Ry., 64 Fed. 165.

erty.[1] This has amounted substantially to the adoption of an undepreciated value as a standard by this commission.

A few of the physical elements in appraisals have caused considerable discussion, particularly in rate cases, and may be referred to briefly.

Shall paving found over pipes, conduit or track construction be included as a part of the cost of these structures? It is not usually the company's property and may have been laid after the structures were in place The more common opinion is that only such paving costs should be included as were actually incurred when the company's work was done, no allowance being made for paving laid subsequently, without cost to the company.[2] It has been pointed out that while this procedure would be logical in a determination of the original cost of a property, it is illogical and incorrect as a part of an estimated Cost of Reproduction.

Shall real estate be included at its original cost or its present value? The difference between the two figures is often large, particularly in the case of terminal, right of way and riparian property. In Cost of Reproduction estimates the Present Value should clearly be used,[3] and, where these estimates are corrected for depreciation, it is at least as logical to allow appreciation of real estate as depreciation of equipment. It has been found that rights of way commonly cost from two to three times the value of adjoining property.

What values have riparian rights in connection with water powers in excess of the cost of real estate and construction? The most logical of the various methods proposed seems to be to determine per horse power of saleable capacity all operating cost, depreciation and a fair return on the investment for all physical property including transmission lines to market. The capitalization of the difference between this and the market value of other and independent sources of power gives the riparian values.

Shall property owned but not used in the conduct of the business be included in appraisals in rate cases? The commissions and courts have usually excluded such property except under circumstances which may be illustrated as follows: Property acquired with good business judgment for future needs

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[1] Hill vs. Antigo Water Co. 3 W. R. C. R. 623, 705-723.

[2] Cedar Rapids Gas Light Co. vs. Cedar Rapids, 120 N. W. Rep. 966, 970.

[3] Consolidated Gas Co. vs. City of New York, 157 Fed. 849, 854-856.

of the business;[1] property contributing to and intimately connected with the business, such as amusement parks;[2] property formerly used but abandoned on account of obsolescence or inadequacy, not written off because of insufficient income.[3]

The foregoing discussion has outlined the procedure in determining the value of physical property. Except for certain disputed points, some of which have been referred to, the work is without special complications, consisting of carefully prepared inventories with suitable unit prices. Public service companies use to a large extent apparatus and materials which have become standardized and have fairly stable or easily determinable values. Labor costs are subject to wider variations and are more difficult to estimate, not only because the results per dollar of expenditure vary with locality or other conditions, but also because they may be hidden or not accessible for careful measurement. Experienced engineers are usually able to estimate with suitable accuracy the various elements which enter into ordinary physical property.

The values so far discussed are bare physical costs representing what may be called Inventory Value or Structural Cost, the latter term being used herein. This by no means represents the total value of the physical property. No work of importance should be undertaken without carefully prepared plans, specifications and engineering advice. Skilled and general supervision of the construction work is also usually advisable. Insurance against fire and accidents during construction is a wise precaution. Interest must be paid on construction funds during the construction period, and brokers are entitled to a fee for furnishing these funds from the sale of the company's securities. Taxes must also be paid on real estate and other property from the date of purchase. Most well developed public service properties are the result of gradual development under which construction costs are greater than if the complete property were assembled at one time. In the latter case a general contractor usually assumes responsibility for the entire work, charging a percentage on all sub-contracts. It is therefore the custom of many appraisers to figure the Structural Cost with wholesale unit prices, and to add a percentage for either "piece meal" construction or contractor's profit. Finally, it is always found

[1] Mayhew vs. King's County Lighting Co., 2 P. S. C. (1st D.) N. Y.

[2] LaCrosse Gas & Electric Co., 8 W. R. C. R. 138, 164.

[3] Darlington Light & Water Co., 5 W. R. C. R. 397, 406; City of Milwaukee vs. Milwaukee Railway & Light Co., 87 Fed. 577.

that inventories of property are more or less incomplete and difficulties encountered in construction are hidden, leading to low values which must be corrected by an added percentage for contingencies.

All these elements, usually expressed as percentages of the Structural Cost, are definite and essential factors in the assembling of the physical property without which it would be incomplete. While often grouped with other so-called " overhead " charges, they should not be confused with " intangible values " which are not as intimately connected with the physical property. The addition of suitable percentages, to be later discussed, to the Structural Cost to cover these physical elements, gives the Cost of Reproduction of the physical property. If the actual original cost of the property is to be determined from accounting records, no additional allowance will be necessary for some of these factors, although others, such as interest during construction, brokerage and administration, may not be provided for fully because improperly included in operating accounts.

There are next to be considered certain elements of cost which antedate the construction of the physical property. Although of vital importance and often of considerable magnitude, they are frequently slighted by appraisers inexperienced in such matters. Among the most important items are the following: Preliminary engineering examinations, estimates and reports covering the field of the project and its prospects, selection of routes and locations, options on property, financing plans and prospectuses, legal examinations and incorporation of company, procuring franchises, certificates, property owners' consents and trackage or other operating agreements, and promoters profits. While these elements are often called " intangibles," this term should not imply that they are indefinite, obscure or unnecessary adjuncts to a properly organized and conducted business. It is argued with force that liberal preliminary expenditures result in more economical construction and financially stable operation.

One further element only remains to be considered to determine the Fair Value of the property. It is the least understood, most inconsistently treated and often entirely ignored element in valuation work. It is variously styled, Good Will, Going Value, Earning Value, Development Cost, etc. Up to this point we have considered the physical property with its necessary " overhead " charges and the organization of a corporation to own

and operate it. So far it has only potential business value. It is merely a collection of inert physical elements with a suitable legal status and capacity to perform certain functions. The intent of its owners and the public which has conferred certain rights upon it is that it shall become an active, useful and profitable thing, in other words a "Going Concern." It must not only offer its wares, but demonstrate that they are reliable, suited to the needs of prospective customers and worth the price asked for them, before it can claim stability as a business enterprise or security as an investment. It is generally recognized that this transformation from potential to kinetic usefulness involves costs to which, from the above description, the terms Going Value and Good Will might logically be applied. These terms, however, have been so loosely and indefinitely used as to suggest the need of a more specific one to indicate the things which may properly be included under such a heading in valuation work. A more careful statement of the items involved will assist in the selection of a more suitable term.

The first step to be taken with a duly incorporated and constructed public utility is the assembling of a suitable operating organization, each part skilled in its particular duties and properly co-ordinating with all other parts. The technical parts of such organizations are often drilled by actual preliminary operation of the equipment for some time before reliable service can be offered to the public. In the meantime the commercial department has undertaken advertising and publicity work in order that, as soon as service can be offered, the public may be ready with patronage. In spite of most active commercial work, a profitable business is very rarely secured at once. Its development may not only be slow but in some communities it may depend upon a growth of the community which the utility itself must foster. Many public service plants are prematurely constructed at the earnest solicitation of growing communities with only hopes of ample future rewards to offset early losses. The same situation is found in suburban sections of larger developed communities, public service extensions to which are being constantly demanded by real estate promoters and others, regardless of economic conditions.

It is, however, in many cases unquestionably a public benefit that transportation and other public service be extended into territory which for some time may be unprofitable. Without them the valuable resources of such territory would remain inac-

cessible. And when the public clearly understands the situation it is usually willing to pay the cost. It may not be able to do so at once because its own resources are taxed for the time being by its own development, but in the long run it is able and willing to pay. At the start it can only afford to pay normal prices for public service, which means a deficit. When and how shall the deficit be paid? The old, conventional way was to allow the public service rates to remain undisturbed with growing business until profits had exceeded normal returns on the growing investment sufficient to wipe out the early deficits. But before this happy time has arrived some aggressive citizens or a public service commission sees apparent exorbitant profits from a public monopoly, and the balance of the unredeemed deficit may be lost.

Even if reason prevails and the company is allowed to make up its deficit in full, the aggressive citizen, although he may not appreciate it, still has a real grievance. He is helping to pay in a comparatively few years the entire cost of the necessary development of the community. If he is economically wise he may properly ask why he and others of his day and generation should bear the entire burden, leaving his successors, who will reap the greatest benefits, entirely free from their costs. Such injustice, as it may fairly be called, is avoided by allowing the public utility to capitalize its losses during the development period, the community then paying at any one time only a fair return upon the total losses. The burden is thus lightened and indefinitely equalized. The evolution of this principle in the last few years has resulted in the approval by certain commissions and courts of the capitalization of losses due to development conditions and the application thereto of the term Development Costs.

Ordinarily the development period is limited to a few years. It may, however, happen in a rapidly expanding community that extensions are steadily in demand beyond economic limits, so that the established profitable parts of the business cannot yield enough at reasonable rates to show a fair return on both profitable and unprofitable elements. In some such cases real estate operators have been willing, temporarily at least, to bear the burden of unprofitable utility investments, paying therefor from the enhanced value of their holdings which the utility has created. Where a more general need of service would render such a proceeding unfair, it again seems reasonable that the community or the part of it which supports the utility should assume the loss to the extent of assuring a continuous fair return upon it.

It thus appears that while Development Cost is largely incurred in putting a business originally upon its feet, it may continue for a much longer period. It is broadly contended that, where any public utility is established with the approval of the community, and economically constructed and operated without obvious lack of business judgment in the ability of the community in the long run to support it at reasonable rates, the community is bound to see that in the long run the utility gets a fair return upon its investment, whether this investment be in property or in losses in its business. This contention may seem radical at first thought, but reflection will convince one that without some assurance of regular reasonable return or more attractive ultimate return on the investment, the former being preferable, very many now successful projects would never have been undertaken, the ground would have remained fallow, and the capital been diverted to other channels.[1]

The above discussion has grouped the various factors which enter into the total cost of an operating company into four more or less distinct parts (1) the bare physical elements; (2) the overhead charges which are necessary to the skillful selection and efficient assembling of these elements; (3) the preliminary and organization expenses of the company, and (4) the cost of developing a profitable business. The matter of inventories and unit costs has been briefly but sufficiently considered. The allowances which are necessary for "overhead" charges need further definition. The first element to be considered is contingencies, because it represents additional physical property, and might properly be classed with such property rather than as an overhead charge. Depending upon the thoroughness in preparation of inventories and examination of the property for abnormal construction conditions, it is customary to allow from 5 per cent. to 10 per cent. In estimates of Cost of Reproduction an allowance of 10 per cent. is commonly made for general contractor's profit. This charge is approved by commissions where wholesale unit prices are used and is a customary charge of contractors for such work. If the actual original cost of the property is to be estimated, contractor's profit would ordinarily be appropriate on only a part, but the balance, constructed "piecemeal," should be figured with unit prices at least 10 per cent. higher. For engineering and supervision it is most common to

[1] Western Rate Case, 20 I. C. C. R. 307, 337-347. Clear discussion, Lane, C.

allow 5 per cent., although a higher percentage is sometimes considered necessary. Some authorities exclude engineering charges, in part at least, from certain equipment such as rolling stock. Liability and fire insurance and taxes during construction are of minor importance, and commonly grouped in authoritative cases with other items. They may amount to approximately 1 per cent. The requirements for interest during construction depend upon the time required to complete the work under estimate. An average allowance is 5 per cent. The funds necessary for carrying on construction work on any large scale are not usually obtainable to best advantage by those immediately interested. It is customary to employ brokers in connection with the issue and sale of securities covering the project. Their fees for such services may be from 2 per cent. to 10 per cent. or more depending upon the attractiveness of the issues and the risks and responsibilities assumed. Such charges should not be confused with, although often intimately connected with, discounts. The latter depend upon the normal rate of return on the securities as compared with the actual rate which an investor demands upon his money after consideration of the risks involved. It is very generally held that discounts are not proper elements in Fair Value. Some authorities take the same view regarding brokerage, but others, with apparently clearer conception of the difference between the two factors, have classed the latter among construction costs and approved its capitalization.[1] The percentages above discussed should be successively added to the Structural Cost.[2]

There is less consistency in the provision made in appraisals for the intangible elements, including the preliminary, organization and promotion costs. They are very largely ignored by some authorities, and given very considerable value by others. From 2 per cent. to 5 per cent. is not uncommon and more has occasionally been allowed.[3]

There is still less agreement with reference to Development Costs. Apparently the lack of full understanding as to what is properly included under this heading, as already referred to, is responsible in some measure for this situation. It also appears

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[1]Hill vs. Antigo Water Co. 3 W. R. C. R. 623, 686-687; Chicago Surface Railways, 5 per cent. (Franchise provision).

[2]N. Y. N. H. & H. R. R. Valuation Report (1911) 58, 84, 86, 123 (General discussion).

[3]Rochester, Corning, Elmira Traction Co., 1 P. S. C. (2nd D.) N. Y. 166.

from a review of authoritative cases that some distinction is made with respect to the purposes of the valuation. The courts have held in a number of cases of sale or purchase that the value of " good will " was from 10 per cent. to 25 per cent. of the cost of reproduction.[1] In rate cases there has been a greater tendency to exclude " good will," and in some cases to specifically exclude the admitted costs of establishing a business. The Wisconsin Railroad Commission has been the pioneer of the state commissions in giving full recognition to Development Costs.[2] In this position it has been supported by prominent engineers who have given the matter special attention.[3] The allowances of the Wisconsin Commission in certain rate cases, where a special study of financial history has been made, have been in the vicinity of 20 per cent.[2] Similar percentages have been approved by the courts in a number of cases.[4] A careful study by competent engineers of the actual losses incurred in developing the business of a number of public utility companies has shown that they agree very closely with an average of 30 per cent. of the Cost of Reproduction.

It will be of interest to consider the aggregate of all the above overhead charges as compared with the Structural Cost. The successive addition of the percentages applying to the physical property gives a Cost of Reproduction from 129 per cent. to 158 per cent. of the Structural Cost. The further addition of percentages connected with the organization of the company gives totals of 131 per cent. to 163 per cent. of the Structural Cost. The final addition of percentages to cover Development Costs gives an undepreciated Fair Value from 141 per cent. to 188 per cent. of the Structural Cost. It thus appears that it is by no means inconceivable that such Fair Value in certain cases may be double the Structural Cost if Development Costs are fully considered.

As so many authorities have so far excluded Development Cost but generally considered all the other overhead elements

[1] National Water Works Co. vs. Kansas City, 62 Fed. 853, 864; Galena Water Co. vs. City of Galena, 74 Kan. 624, 87 Pac. 735.

[2] State Journal Printing Co. vs. Madison Gas & El. Co. 4 W. R. C. R. 501, 577-587.

[3] H. P. Gillette, Sundry articles in " Engineering and Contracting " (Oct. 11, 1911, June 26, 1912).

[4] Metropolitan Trust Co. vs. H. & T. C. Ry. Co. 90 Fed. 683, 687; Columbus Ry. & Lt. Co. vs. City of Columbus, Special Master's Report (Linn) 1906; Pioneer Tel & Tel. Co. vs. Westenhaver et al. 118 Pac. 354.

discussed, although grouping them according to individual preference, and omitting such as seemed foreign to the cases in question, the totals which certain of them allow may be compared with the totals given above, stated in per cent. of the Structural Cost, namely 31 per cent. to 63 per cent. The New York 1st District Commission has allowed about 40 per cent. total in several cases.[1] The Wisconsin Commission habitually uses 12 per cent. based on very complete inventories, and excluding brokerage. A special commission in Massachusetts used 23 per cent. in its valuation of the electric railway properties of the New York, New Haven & Hartford railroad.[2] The Washington Commission has used 28 per cent. in an electric railway rate case.[3] The Traction Valuation Commission used 25 per cent. in appraising the Chicago surface railways. The Boston Transit Commission found the actual cost of its work of designing and constructing the Boston subways was 23.6 per cent. of the physical costs, not including brokerage and some other costs encountered in private work. A number of prominent engineers and appraisers, including B. J. Arnold, Prof. M. E. Cooley, William B. Parsons and Louis Bell, use totals approximating 25 per cent., all without brokerage. When it is considered that many of the above percentages are based on structural costs figured on a retail rather than wholesale construction basis, so that the 10 per cent. contractor's profit is not necessary among the overhead charges, it will be seen that the totals are consistent with those previously developed, which as stated are based on wholesale construction methods and prices. The totals to be selected for any particular case must depend upon the character and completeness of the inventory and structural cost figures as well as the purposes of the appraisal.[4] As has already been suggested, for purposes of property taxation or bond issue the physical elements and their overhead percentages only are ordinarily considered. In rate cases, all elements which enter into the Fair Value should be included. For purposes of purchase or sale the Fair Value will be considered in connection with original cost, capitalization, present earning power, future prospects and other factors familiar to the investor.

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[1] Queens Borough Gas & Electric Co. 2 P. S. C. (1st D.) N. Y.

[2] N. Y. N. H. & H. R. R. Valuation Report p. 127.

[3] Puget Sound Electric Ry. vs. Railroad Com. 64 Wash., 117 Pac. 739.

[4] "Valuation of Public Utilities." Halford Erickson (Wisconsin R. R. Com.) in "Public Service Regulation" May-June, 1912. (Discussion.)

There remains to be considered in some detail the procedure in rate cases, which are becoming more and more common with the establishment of public service commissions. The principle established by these regulating bodies is that rates should be no higher than are necessary to yield a fair return to the owners of the properties, any increase in profits being followed by corresponding rate reductions. There has been occasional recognition of the fact that restriction of return tends to destroy in large measure the incentive to increased efficiency and aggressive expansion in the conduct of the business and to the retention of older types of equipment, in short, to extreme conservatism, which is not to the interest of either the public or the company. Such recognition has taken the form of the so-called sliding scale, which attempts to divide between public and company the gains from the increased efficiency and progressive business policy.[1] The more conservative method of regulation may be more specifically described as follows: A company may charge only such rates as will provide for necessary operating expenses, including full maintenance of the property, taxes, a proper allowance for depreciation, and a reasonable return upon the fair value of the property. The important questions involved are as follows: 1. What is a proper depreciation allowance? 2. What is a reasonable return? 3. What is the fair value of a property?

The subject of depreciation presents unusual complications. It has been studied and discussed with great patience and thoroughness, but with equally great diversity of conclusions except upon one point, namely, that no one knows with any approach to accuracy the useful life of present day physical property used in public service. A large amount of information has been collected by or from experienced engineers with reference to the actual or estimated life of various physical elements of established type. From this we may deduce that a certain machine under given service conditions will wear itself out in a certain number of years. But we do not know that economic, social, political, engineering or other conditions will continue such as to permit this machine to live out its natural life in peace. Long before that time has come it may give way to a larger, more efficient, or otherwise more suitable type. We are, therefore, confronted with a complex factor in depreciation which has been aptly styled

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[1] Boston Consolidate Gas Co.; Western Rate Case, 20 I. C. C. R. 307, 333. (Discussion.)

"functional depreciation" as distinct from the better understood "physical depreciation." No conservative engineer has yet ventured to predict its effect upon the useful life of apparatus, although some have guessed that it is the predominant factor in a considerable proportion of the elements which constitute a public service property. In spite of its indefiniteness the problem inevitably confronts us, and must be solved tentatively at least until larger experience and more stable engineering conditions permit a more definite solution.

It is recognized, for rate making purposes, that earnings should be sufficient to provide fully for the replacement of physical elements at the end of their useful life and for extraordinary repairs during that life. What, with our present light, shall be set aside for this purpose? It is the custom of many companies to retain not less than 10 per cent. of their gross earnings before dividends are declared, or to retain from 20 per cent. to 25 per cent. for depreciation and maintenance together, recognizing the intimate connection between the two, and that the latter may necessarily be variable from year to year. Another and more accurate method is to set aside a certain percentage of the cost of the physical property, either as a whole or by appyling suitable varying percentages to different groups of elements.[1] The last method is the one usually adopted in rate cases, partly because physical valuations are usually made available, and logically also because gross earnings, the other basis of determination are assumed to be questioned. The New York 1st District Commission has concluded that the useful life of electric lighting and gas property as a whole is about twenty years.[2] The Wisconsin Commission has decided that eighteen years is sufficient for electric railway property,[3] and for electric lighting property 17.5 years.[4] Other decisions and opinions are reasonably consistent with these. A more detailed study has been made by the Washington Commission in the case of an interurban electric railway in which depreciation (or appreciation) was determined by observation or calculation and applied to the "wearing value" of

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[1] Queens County Water Co. vs. Woodbury, 67 N. Y. 490, 493 (Discussion).

[2] Queens Borough Gas & Electric Co., 2. P. S. C. (1st D.) N. Y.

[3] Average of all Electric Railways. (In one case 17 yrs., 4 W. R. C. R.: 89, 96).

[4] Madison case, 4 W. R. C. R., 501, 596.

each element of the property.[1] The net result was an annual reduction in value of approximately 3.5 per cent. of the Cost of Reproduction.

If the useful life in years is assumed, and the corresponding annual percentage is required, the question at once arises as to whether it should be determined on a " straight line " or " compound interest " basis. In actual practice it will usually be found that companies do not set aside and invest depreciation funds. Funds for construction purposes are in almost constant demand, and interest paid thereon is usually higher than the return on invested funds, so that available cash is used for current requirements, and later reimbursed by capitalization of completed construction, to be again used for further similar purposes.[2] Income from depreciation funds would, therefore, be bookkeeping rather than actual. In the long run, a depreciation fund, if accumulated, would also be periodically drawn upon for replacements of worn out equipment. The more practical rate, therefore, seems to be the " straight line " one. For a useful life of twenty years this would require a 5 per cent. annual reverse. While this may be unnecessarily high for property containing a large proportion of non-depreciable elements, such as rights of way and terminals, and also because scrap value has not been allowed for, the factor of functional depreciation, which is rarely given due consideration, may more than offset any necessary corrections. The allowances of the courts and commissions have commonly been between 3 per cent. and 5 per cent.

The rate of return to be allowed on the value of the property varies with the location and character of the business. The basis from which it is determined is logically the rate charged by banks in the local field for secured loans. The return on public service investments should be enough higher than this rate to compensate for lesser security of both principal and return on account of possible unwise municipal or other restrictions, competition, and other adverse influences.[3] Public service property is peculiar, in that, after its field of usefulness is selected, it is fixed beyond recall, transfer or abandonment, regardless of unfavorable industrial, municipal, labor, or other conditions

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[1] Spokane & Inland Empire Electric Ry., " Engineering & Contracting." Dec. 27, 1911 p. 696 (Gray, Eng.)

[2] Madison Case, 4 W. R. C. R. 501, 599-611.

[3] Brunswick and Topham Water District vs. Maine Water Co. 99 Me. 371, 375, 386.

which may arise.[1] It is generally believed that an exclusive or indeterminate franchise which insures freedom from competition, justifies a lower rate of return than otherwise, and therefore permits lower rates to the public. Also that even under these conditions a rate 2 per cent. higher than prevailing bank rates is justifiable and essential to secure the capital necessary to satisfactorily conduct and expand the business.[2] Commissions have approved rates of return of 7 per cent. and 8 per cent. under non-competitive conditions,[3] and opposing experts have agreed that 10 per cent, was not excessive in cases where competitive sentiment prevailed in a community although competition might not actually exist.[4] It should be remembered in considering authorities on this point that the courts are usually called upon to decide whether or not certain rates are confiscatory, whereas the commissions decide if they are fair.

The question of the fair value of the property, to which rates of return as above discussed shall be applied, has been already considered. It may be assumed that Present or Depreciated Value is that approved by a majority of authorities, but that such value should not be used unless depreciation has been earned or unless unearned depreciation and other losses have been included in Development Costs. The depreciated value of well maintained utilities is normally between 75 per cent. and 85 per cent. of the Cost of Reproduction. The matter of depreciation of overhead charges may be considered. Some authorities depreciate all such charges at the same rate as the physical property.[5] A greater number depreciate none of them.[6] Others, with more logic, analyze the overhead elements into depreciable and non-depreciable groups — scaling down those most intimately associated with the physical elements, and retaining the balance at their full value.[7]

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[1] San Diego Water Co. vs. City of San Diego, 118 Cal. 556, 568.

[2] C. G. Young, " Logical Basis for Valuation " 1911.

[3] Madison Case, 4 W. R. C. R. 501 (Gas 7 per cent., Electric 8 per cent.); Mayhew vs. Kings County Lighting Co. 2 P. S. C. (1st D.) N. Y. (7.5 per cent.); Queens Borough Gas & Electric Co. 2 P. S. C. (1st D.) N. Y. (8 per cent.)

[4] Savannah & Suburban St. Ry. Imp. Ass'n. vs. Savannah Electric Co. Ga. Ry. Com. Jan. 3, 1912.

[5] Wisconsin Railroad Commission.

[6] Seattle Telephone appraisal, W. R. C. " Engineering & Contracting." May 3, 1911, pp. 520-524 (Gray, Eng.).

[7] New York 1st District Commission. Met. St. Ry. Reorganization, 3 P. S. C. (1st D.) N. Y. 113, 155.

After assuming in any specific rate case a suitable rate of return upon the fair value of the property, determining depreciation requirements and adding operating expenses and taxes, the total amount which may be earned is obtained. If this is less than actual earnings, suitable reductions in rates are justifiable. If, on the other hand, the total is greater than the actual earnings, an increase in rates would be equally appropriate.

No reference has been made above to the inclusion of franchise values in appraisals, other than to provide for the bare costs of acquiring them among the organization expenses. While in some appraisals large values have been allowed for franchises,[1] it has been very generally held that all such rights, freely granted by the public, are not properly capitalized.[2] If, on the other hand franchises are actually sold by municipalities, the price paid by the company is a proper part of the Fair Value of the property.[3] Franchises freely granted are often the subject of taxation. The determination of a franchise value for such purposes is sometimes required. In a few states the procedure is defined by law, in others it is largely a matter of guess work. In most cases there is some recognition of the so-called net earning rule, which, as defined by the New York courts, may be briefly stated as follows: Deduct from gross earnings, operating expenses including maintenance and depreciation, and a reasonable return on the value of tangible property devoted to public uses, the balance capitalized at a fair rate giving the franchise value.[4] It will at once be seen that under strict commission rate regulation the franchise value would be substantially equal to the overhead charges not directly applicable to the physical property.

In closing, a word may be added with reference to the relation between Fair Value as considered herein and actual capitalization of the average public service company. Capitalization is commonly ignored or given comparatively little consideration in rate cases because of scepticism as to its proper relation to the value of the property. In cases where capitalization is not or was not under commission control, many companies have been organized with a bonded indebtedness and preferred stock issue

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[1] Chicago Surface Railways (Traction Valuation Commission); Consolidated Gas Co. N. Y. 146 Fed. 150, 157.

[2] Hill vs. Antigo Water Co. 3 W. R. C. R. 623, 723-730.

[3] City of Appleton vs. Appleton Water Co. 5 W. R. C. R. 215, 281-284.

[4] Jamaica Water Co. vs. Tax Com., 196 N. Y. 39, 55.

together representing approximately the original cost of the physical property with the overhead charges immediately applying thereto. In addition, there has been issued a certain amount of common stock, distributed with the major securities as a bonus. Such common stock has commonly been termed " water " and has led to charges of gross over-capitalization. Such charges are not without foundation in some cases, but in a greater number they will be found unjust if the Development Cost principle is accepted. It has been stated herein that the cost of developing a profitable business in the case of a number of specific public service companies was found to be about 30 per cent. of the cost of the physical property (or Cost of Reproduction). A study of the capitalization of such companies will show that this is not far from the percentage of common stock as compared with the major securities, at least as regards the more conservatively capitalized of the operating companies, and that, where the percentage of common stock is greater, the risk of the investment is greater and the period of assured profit more remote, indicating a correspondingly greater Development Cost.

The promoters of such enterprises have simply estimated in advance the probable cost of establishing a profitable business, and capitalized it in such a way that a return, never definitely assured, is deferred until it is earned. In the meantime, the investor receives a rate of return on his cash investment below the fair amount. If future prospects fail to materialize, the investor loses permanently the return on the common stock, which might otherwise bring his return on his cash investment up to the fair rate. In either event the community is not called upon to furnish a return beyond the fair rate, and initially pays less. The investor, therefore, gets less and the community more than under the Development Cost principle, which entitles the investor to a future return on his early deficiencies in income. In the large majority of cases it will be found that bonus common stock is limited to the original issue at the time of organization, future additions to the property being financed by major securities, thus bearing out the contention that common stock is a conservative method of financing legitimate costs of development.

In the foregoing discussion of the preparation and use of valuation figures, quotations from authorities have been necessarily omitted, but references have been made to various decisions and opinions, so that further study of the subject may be

facilitated. Until recently there has been very little comprehensive literature on the subject. A paper by Henry Earle Riggs, before the American Society of Civil Engineers, in 1910, was unique in its thorough detailed treatment. Since the present article was projected three books have appeared with extensive treatment of valuation work and its applications H. A. Foster[1] discusses the subject largely from an engineering point of view. Henry Floy[2] adds to his valuation discussion a thorough analysis of depreciation. It has been left to Dr. Whitten,[3] librarian-statistician of the New York 1st District Commission, to produce a work of exceptional interest and value, particularly from an economic and legal view point. Dr. Whitten's book also contains a very complete bibliography of both valuation and depreciation, which should be of special interest in further study of this subject.

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[1]Horatio A. Foster, " Engineering Valuation of Public Utilities and Factories." The D. Van Nostrand Co.

[2]Henry Floy, " Valuation of Public Utility Properties," McGraw-Hill Book Co.

[3]Robert H. Whitten, " Valuation of Public Service Corporations," Banks Law Pub. Co.

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